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Prevalence of Anemia and Its Association with Severity of Abnormal Uterine Bleeding

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KEYWORDS

Anemia, Abnormal Uterine Bleeding, Severity.

ABSTRACT:

Background: Abnormal uterine bleeding (AUB), affects a large number of women and significantly impacts their health, quality of life, and daily functioning. The purpose of this study is to determine the prevalence of anemia and evaluate its association with the severity of abnormal uterine bleeding (AUB) in women of reproductive age.

Methods: This hospital-based cross-sectional study at the Department of Obstetrics and Gynaecology, Bangladesh Medical University (BMU), Dhaka, Bangladesh (Jan–Dec 2025), included 120 women aged 25–50 years with abnormal uterine bleeding. Participants provided informed consent, and data on demographics, BMI, and bleeding severity (PBAC) were collected. Hemoglobin was measured to assess anemia per WHO criteria. Associations between AUB severity and anemia were analyzed using Chi-square and ANOVA, with $p < 0.05$ considered significant.

Results: Among 120 women with AUB, most were aged 36–45 years (58.3%) with a mean age of 39.1 ± 5.9 years, and multiparous (58.4%). BMI was normal in 37.5%, overweight in 40.0%, and obese in 22.5%. Duration of symptoms was 6–12 months in 41.7%. PBAC scores indicated mild AUB in 23.3%, moderate in 43.3%, and severe in 33.3%. Anemia was present in 71.7% (mean hemoglobin 9.5 ± 1.5 g/dL), predominantly moderate (44.2%). Anemia prevalence and severity increased with AUB: 42.9% in mild, 76.9% in moderate, and 85.0% in severe, with mean hemoglobin decreasing from 11.4 to 8.1 g/dL.

Conclusion: Anemia is highly prevalent in women with abnormal uterine bleeding, with its severity increasing in parallel with the intensity of menstrual blood loss.

Introduction

Abnormal uterine bleeding, often referred to as Dysfunctional Uterine Bleeding (DUB), is a condition that affects a significant number of women and has a considerable negative impact on their health and overall quality of life [1]. AUB is among the most frequently reported gynecological problems in women of reproductive age and constitutes a major reason for visits to outpatient clinics and hospital admissions worldwide [2]. This condition encompasses variations in the amount, duration, or frequency of menstrual bleeding. Studies estimate that AUB affects approximately 10–30% of women during their reproductive years, and up to half of perimenopausal women may experience it [3,4]. Beyond the physiological effects, AUB can lead to economic burdens, decreased productivity, compromised health status, and increased use of medical services, sometimes even necessitating surgical procedures such as hysterectomy [5,6]. The condition is generally characterized by irregularities in the menstrual cycle, including alterations in frequency, duration, and volume of menstrual blood flow.

The causes of AUB are complex and have been systematically classified by the International Federation

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of Gynaecology and Obstetrics using the PALM-COEIN system for non-pregnant women. This framework divides the causes into nine categories: polyps, adenomyosis, leiomyomas, malignancy and hyperplasia, coagulopathies, ovulatory dysfunction, endometrial disorders, iatrogenic factors, and causes that are not yet classified. Structural abnormalities (the PALM group) are typically detectable using imaging techniques and histopathological evaluation [7]. Clinically, it is important to differentiate acute bleeding from chronic bleeding. Chronic AUB, defined as persistent or recurrent abnormal bleeding lasting several months, can result in blood loss that exceeds the body's ability to maintain normal iron levels. In cases of severe acute bleeding, initial management focuses on stabilizing the patient with fluids, blood products, and vasoactive support. For women with chronic bleeding, the priority shifts to thorough diagnostic evaluation and management of the underlying cause [8].

One of the most serious consequences of prolonged AUB is anemia, particularly iron deficiency anemia, which arises from ongoing blood loss [9]. Recurrent menstrual bleeding gradually depletes iron stores, ultimately impairing hemoglobin production, reducing oxygen-carrying capacity, and limiting tissue oxygenation. Women with chronic blood loss often experience fatigue, reduced exercise tolerance, cognitive difficulties, and decreased work productivity, all of which significantly compromise quality of life and daily functioning [10]. Evidence indicates that over a quarter of women with heavy menstrual bleeding exhibit iron deficiency anemia [11]. In low-resource settings, nutritional deficiencies further exacerbate the risk and severity of anemia in affected women.

Despite the known link between chronic AUB and anemia, few studies have rigorously quantified anemia severity in this patient population. Many prior investigations focus broadly on heavy menstrual bleeding without specifically isolating DUB as a distinct clinical entity [12]. Differences in diagnostic criteria, assessment methods, and study designs have contributed to variability in reported prevalence and severity of anemia. This gap in the literature limits the ability to develop population-specific strategies for prevention, early diagnosis, and treatment. Although AUB is highly prevalent, there remains a lack of comprehensive data in local populations that details both the burden of anemia and its systemic consequences [13]. Consequently, anemia in women with chronic AUB often goes underdiagnosed and undertreated, with clinical attention frequently directed primarily toward controlling menstrual blood loss rather than addressing the associated hematologic complications [14]. The purpose of this study is to determine the prevalence of anemia and evaluate its association with the severity of abnormal uterine bleeding (AUB) in women of reproductive age.

Objective

- To determine the prevalence of anemia and evaluate its association with the severity of abnormal uterine bleeding (AUB) in women of reproductive age.

Methodology & Materials

This hospital-based cross-sectional study was conducted at the Department of Obstetrics and Gynaecology, Bangladesh Medical University (BMU), Dhaka, Bangladesh, from January to December 2025. A total of 120 women presenting with abnormal uterine bleeding (AUB) were included in the study, selected according to predefined inclusion and exclusion criteria. The study aimed to determine the prevalence of anemia and evaluate its association with the severity of AUB among women of reproductive age.

Inclusion Criteria:

- Women aged 25–50 years presenting with abnormal uterine bleeding
- Women willing to participate and provide written informed consent
- Women attending the Department of Obstetrics and Gynaecology, BMU, during the study period

Exclusion Criteria:

- Pregnant or postpartum women (within 6 months of delivery)
- Women with known bleeding disorders or hematologic diseases unrelated to AUB
- Women receiving anticoagulant therapy
- Patients with reproductive tract malignancy or systemic illnesses affecting hemoglobin levels (e.g., chronic kidney disease)
- Women with a history of hysterectomy or major gynecological surgery

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Eligible participants were enrolled consecutively during the study period after obtaining written informed consent. Baseline demographic and clinical information, including age, parity, body mass index (BMI), and duration of AUB symptoms, were collected using a structured data collection form. Height and weight were measured using standardized procedures, and BMI was calculated and categorized as normal (18.5–24.9 kg/m²), overweight (25–29.9 kg/m²), or obese (≥30 kg/m²). The severity of menstrual blood loss was assessed using the Pictorial Blood Loss Assessment Chart (PBAC), which provides a standardized quantitative estimate of menstrual blood loss. Based on PBAC scores, AUB was classified as mild (<100), moderate (100–200), or severe (>200). Venous blood samples were obtained from all participants for hemoglobin estimation using standard laboratory methods. Anemia was defined according to World Health Organization (WHO) criteria and categorized as mild, moderate, or severe. Data were entered, cleaned, and analyzed using appropriate statistical software. Continuous variables were expressed as mean ± standard deviation (SD), and categorical variables were presented as frequencies and percentages. The association between AUB severity and anemia prevalence was analyzed using the Chi-square test. Differences in mean hemoglobin levels across AUB severity categories were assessed using one-way analysis of variance (ANOVA). A p-value <0.05 was considered statistically significant. Written informed consent was obtained from all participants, and strict confidentiality of patient information was maintained throughout the study.

Results

Table 1: Baseline Characteristics of the Study Participants (n = 120)

Characteristic		**Frequency (n)**	**Percentage (%)**
Age Group (Years)	25–35	32	26.7
	36–45	70	58.3
	>45	18	15.0
	Mean ± SD	**39.1 ± 5.9 years**	
Parity	Nulliparous	22	18.3
	Primiparous (1 child)	28	23.3
	Multiparous (≥2 children)	70	58.4
BMI (kg/m²)	Normal (18.5–24.9)	45	37.5
	Overweight (25–29.9)	48	40.0
	Obese (≥30)	27	22.5
Duration of AUB Symptoms	<6 months	35	29.2
	6–12 months	50	41.7
	>12 months	35	29.2

The study included 120 women with abnormal uterine bleeding (AUB). Most participants were aged 36–45 years (70, 58.3%), followed by 25–35 years (32, 26.7%) and >45 years (18, 15.0%), with a mean age of 39.1 ± 5.9 years. Regarding parity, the majority were multiparous (70, 58.4%), followed by primiparous (28, 23.3%) and nulliparous (22, 18.3%). Body mass index (BMI) distribution showed 45 women (37.5%) with normal BMI, 48 (40.0%) overweight, and 27 (22.5%) obese. Duration of AUB symptoms was <6 months in 35 women (29.2%), 6–12 months in 50 women (41.7%), and >12 months in 35 women (29.2%).

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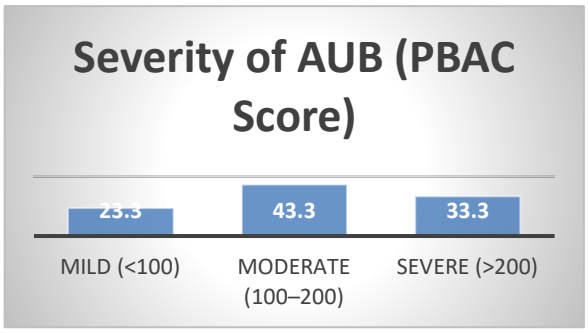

Figure 1: Severity of Abnormal Uterine Bleeding Based on PBAC Score (n = 120)

Among participants, 28 women (23.3%) had mild AUB (PBAC score <100), 52 (43.3%) had moderate AUB (100–200), and 40 (33.3%) had severe AUB (>200).

Table 2: Prevalence of Anemia Among Participants (n = 120)

Anemia Status	Frequency (n)	Percentage (%)
Anemic	86	71.7
Non-Anemic	34	28.3
Total	120	100.0
Mean Hemoglobin Level	9.5 ± 1.5	

Anemia was present in 86 women (71.7%), whereas 34 participants (28.3%) had normal hemoglobin levels. The mean hemoglobin level of the study population was 9.5 ± 1.5 g/dL.

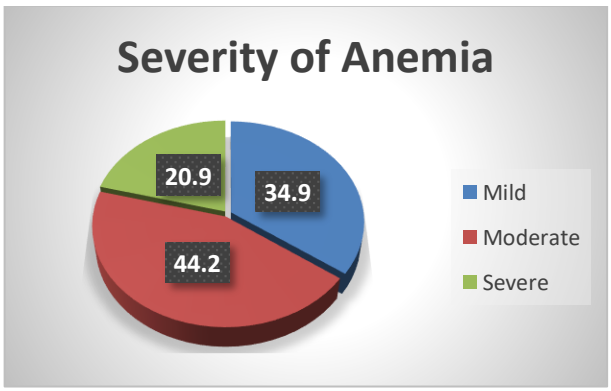

Figure 2: Severity of Anemia Among Anemic Participants (n = 86)

Among anemic participants, 30 women (34.9%) had mild anemia, 38 (44.2%) had moderate anemia, and 18 (20.9%) had severe anemia.

Table 3: Association Between Severity of AUB and Anemia Status (n = 120)

Severity of AUB	Total (n)	Anemic n (%)	Non-Anemic n (%)	p-value
Mild	28	12 (42.9)	16 (57.1)	**<0.001**
Moderate	52	40 (76.9)	12 (23.1)	
Severe	40	34 (85.0)	6 (15.0)	
Total	120	86 (71.7)	34 (28.3)	

The prevalence of anemia increased with the severity of AUB. Among women with mild AUB, 12 (42.9%) were anemic. In the moderate AUB group, 40 (76.9%) were anemic, and in the severe AUB group, 34 (85.0%) were anemic. This association was statistically significant ($p < 0.001$).

Table 4: Mean Hemoglobin Level According to Severity of AUB (n = 120)

Severity of AUB	Mean Hemoglobin (g/dL)	Standard Deviation (SD)	p-value
Mild	11.4	1.3	**<0.0001**
Moderate	9.6	1.5	
Severe	8.1	1.7	

Mean hemoglobin levels decreased with increasing AUB severity. Women with mild AUB had 11.4 ± 1.3 g/dL, moderate AUB 9.6 ± 1.5 g/dL, and severe AUB 8.1 ± 1.7 g/dL ($p < 0.0001$).

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Table 5: Distribution of Anemia Severity Across Different AUB Severities (n = 120)

Severity of AUB	Total (n)	No Anemia n (%)	Mild Anemia n (%)	Moderate Anemia n (%)	Severe Anemia n (%)
Mild AUB	28	16 (57.1)	8 (28.6)	4 (14.3)	0 (0.0)
Moderate AUB	52	12 (23.1)	14 (26.9)	18 (34.6)	8 (15.4)
Severe AUB	40	6 (15.0)	8 (20.0)	16 (40.0)	10 (25.0)
Total	120	34 (28.3)	30 (25.0)	38 (31.7)	18 (15.0)

Among women with mild AUB (n = 28), the majority (16, 57.1%) had no anemia, 8 (28.6%) had mild anemia, 4 (14.3%) had moderate anemia, and none had severe anemia. In the moderate AUB group (n = 52), only 12 women (23.1%) had no anemia, whereas 14 (26.9%), 18 (34.6%), and 8 (15.4%) had mild, moderate, and severe anemia, respectively. Among participants with severe AUB (n = 40), 6 (15.0%) had no anemia, 8 (20.0%) had mild anemia, 16 (40.0%) had moderate anemia, and 10 (25.0%) had severe anemia.

Discussion

Abnormal uterine bleeding (AUB) is a common gynecological condition that can lead to significant hematologic complications if not appropriately evaluated and managed. Anemia, particularly iron deficiency anemia, serves as a key marker of the systemic impact of AUB and reflects the severity of blood loss experienced by affected women. The findings of this study demonstrate that increasing severity of AUB, as measured by PBAC scores, is associated with progressive reductions in hemoglobin levels and higher prevalence of anemia. These results highlight the clinical importance of early assessment of bleeding severity in women with AUB to guide timely investigation, prevent anemia, and improve overall health outcomes.

The baseline characteristics of the present study demonstrate that abnormal uterine bleeding (AUB) was most common among women in the reproductive and perimenopausal age group, with the majority (58.3%) aged 36–45 years and a mean age of 39.1 ± 5.9 years. This finding closely aligns with the observations of Sharma et al.[15], who reported a comparable mean age of 37.65 ± 5.23 years among women with AUB, indicating that AUB predominantly affects women in their late reproductive years. Similarly, the association between higher body mass index and AUB in the present study—where 62.5% of participants were either overweight (40.0%) or obese (22.5%)—is consistent with the findings of Silaphongpaiboon et al.[16], who demonstrated a significant relationship between elevated BMI and abnormal bleeding in reproductive-aged women. Sharma et al.[15] also documented a mean BMI of 27.92 ± 3.04 kg/m², with most participants above normal BMI, further supporting the role of increased adiposity in the pathophysiology of AUB. In addition, the predominance of multiparous women (58.4%) in our cohort reflects the typical demographic distribution of AUB in hospital-based studies. Overall, the age, parity, and BMI patterns observed in the present study are in concordance with previously published literature, reinforcing the established association of AUB with late reproductive age, higher body mass index, and multiparity.

In the present study, assessment of bleeding severity using the PBAC score demonstrated that the majority of women experienced moderate (43.3%) or severe (33.3%) abnormal uterine bleeding, with only 23.3% having mild symptoms. Thus, more than three-quarters (76.6%) of participants had PBAC scores ≥100, indicating clinically significant menstrual blood loss. These findings are consistent with the observations of Suseela et al.[17], who reported that a high proportion of women with AUB had elevated PBAC scores (>150) prior to treatment, reflecting moderate to severe bleeding in reproductive-age women. Similarly, Pandya et al.[18] documented a high average baseline PBAC score (approximately 199) in a large cohort of 316 women, with the majority scoring above 100, signifying substantial menstrual blood loss. The predominance of moderate and severe PBAC categories in our study aligns with these reports and reinforces the clinical utility of PBAC scoring in identifying the considerable burden of heavy menstrual

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bleeding among women presenting with AUB in tertiary care settings.

In the present study, anemia was observed in 86 out of 120 women with abnormal uterine bleeding, accounting for 71.7% of the cohort, with a mean hemoglobin level of 9.5 ± 1.5 g/dL. This high prevalence is consistent with the findings of Siddiqi et al.[19], who reported anemia in 78.3% of women with chronic AUB, with moderate anemia being the most common severity, and only 21.7% of participants having normal hemoglobin levels. Similarly, Afzal et al.[20] observed that anemia was highly prevalent among women with AUB, with rates ranging from 64% to 78%, and moderate anemia predominating. These studies, together with our findings, underscore the substantial hematologic burden associated with AUB, highlighting that a majority of affected women experience some degree of anemia, which necessitates careful evaluation and timely management to prevent further complications.

Among the 86 anemic women in the present study, moderate anemia was the most common severity, affecting 44.2% of participants, followed by mild anemia in 34.9% and severe anemia in 20.9%. This distribution closely aligns with the findings of Khatun et al.[21], who reported that among 120 women with dysfunctional uterine bleeding, 82.5% were anemic, with moderate anemia (38.3%) predominating, followed by mild (28.3%) and severe anemia (15.8%). Similarly, Siddiqi et al.[19] observed that moderate anemia was the most frequent category (36.6%) in a cohort of women with chronic AUB, with mild (31.7%) and severe anemia (10.0%) occurring less commonly. These consistent patterns across studies indicate that in women with AUB, moderate anemia tends to be the largest category, highlighting the substantial hematologic impact of abnormal uterine bleeding and emphasizing the need for early detection and appropriate management to prevent progression to more severe anemia.

The prevalence of anemia in our study increased progressively with the severity of abnormal uterine bleeding, affecting 42.9% of women with mild AUB, 76.9% with moderate AUB, and 85.0% with severe AUB, demonstrating a strong and statistically significant association ($p < 0.001$). These findings are consistent with Siddiqi et al.[19], who reported anemia in 78.3% of women with chronic AUB and observed that prolonged or heavier bleeding was strongly linked to greater anemia severity and lower hemoglobin levels. Similarly, Soni et al.[22] found that moderate to severe anemia was significantly more common in women experiencing heavy menstrual bleeding, with anemia prevalence rising in parallel with the intensity of bleeding. Together, these studies reinforce the observation that increased AUB severity substantially elevates the risk of anemia, highlighting the need for early identification and management of hematologic complications in women with heavier menstrual losses.

In the present study, mean hemoglobin levels decreased progressively with increasing severity of abnormal uterine bleeding, measuring 11.4 ± 1.3 g/dL in women with mild AUB, 9.6 ± 1.5 g/dL in moderate AUB, and 8.1 ± 1.7 g/dL in severe AUB ($p < 0.0001$). This inverse relationship between bleeding severity and hemoglobin concentration is consistent with the findings of Khatun et al.[21], who reported that patients with excessive menstrual blood loss had significantly lower hemoglobin, serum ferritin, and iron levels, with hemoglobin decreasing as blood loss increased. Similarly, Barros et al.[8] highlighted that chronic heavy or prolonged bleeding is a major contributor to iron deficiency anemia, noting that cumulative menstrual blood loss leads to progressively lower hemoglobin levels. These studies corroborate our observations, emphasizing that women with more severe AUB are at heightened risk for significant reductions in hemoglobin and underlying iron deficiency, underscoring the importance of early detection and management of anemia in this population.

Finally, the distribution of anemia severity across different AUB categories demonstrates a clear trend of increasing anemia burden with greater bleeding severity. Among women with mild AUB, most participants (57.1%) had no anemia, and none had severe anemia, whereas in moderate AUB, the proportion of moderate and severe anemia increased to 34.6% and 15.4%, respectively. This pattern was even more pronounced in severe AUB, where 40.0% and 25.0% of women had moderate and severe anemia, respectively. These findings are consistent with Siddiqi et al.[19], who reported that in a cohort of 120 women with chronic AUB, moderate anemia (36.6%) and severe anemia (10.0%) were common, with more pronounced anemia observed in women experiencing heavier or prolonged

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bleeding. Similarly, Iqbal et al.[23] observed that anemia prevalence and severity increased with the amount of menstrual blood loss, with moderate and severe anemia more frequent among women with heavier bleeding. Together, these studies reinforce the strong association between AUB severity and anemia, highlighting that women with more severe menstrual bleeding are at a substantially higher risk of moderate to severe anemia, emphasizing the importance of timely assessment and management of hematologic complications in this population.

Limitations of the study

This study had some limitations:

- Limited sample may restrict the generalizability of the findings.
- Single-center study, which may not reflect diverse populations.
- Geographically restricted participants, potentially affecting applicability to other regions or ethnic groups.

Conclusion

Abnormal uterine bleeding (AUB) is a common gynecological problem that can significantly impact women's health and quality of life, often leading to iron deficiency and anemia. In this study, anemia was found to be highly prevalent among women with AUB, with its frequency and severity closely linked to the intensity of menstrual bleeding. Moderate AUB was the most commonly observed bleeding pattern, followed by severe and mild categories. Importantly, both the prevalence and severity of anemia increased with the severity of bleeding, and mean hemoglobin levels declined progressively from mild to severe AUB. The distribution of anemia severity further highlighted that moderate and severe anemia were more common in women with heavier bleeding. These findings emphasize the strong association between AUB severity and hematologic compromise, underscoring the importance of early assessment and timely management of anemia in women presenting with significant menstrual blood loss.

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